

NOTE.—Since the above was written I have severed my connection with the Queensland Museum, but in the practice of my present business as assayer and mining expert I still hope to be able to obtain further information regarding Queensland minerals. When I wrote my catalogue Eidsvold goldfield had not broken out, nor had Croydon assumed such a prominent position as it now holds. From the Bismarck mine at Eidsvold a specimen of syenite containing 2 ozs. of gold to the ton passed lately through my hands. On the Croydon goldfield are found gold, silver, ceragyrite, iron pyrites, zinc-blende, and other minerals. An addition to the known minerals of Queensland has lately been made by Mr. A. W. Clarke, who discovered scolecite in the granite of the Rainbow claim, Charters Towers. This discovery has, I think, been communicated to the Royal Society of Queensland by Mr. Clarke, who accompanies his description with analyses.—EDWD. B. LINDON, *July, 1888*.

ON PERIPATUS AND ITS OCCURRENCE IN AUSTRALIA ;

BY

HENRY TRYON.

(*Read on 15th April, 1887*).

IN placing on record the rediscovery of *Peripatus* in Australia, a brief notice of the circumstances under which the particular specimens of the noteworthy animal bearing this name, and now exhibited, were found, would seem to suffice. As, however, very few in the colony appear to have met with this name in the connection in which it is now used, much less to be conversant with the almost unique interest which, in the eyes of the philosophic naturalist, centres around the genus of animals which "*Peripatus*" denotes, it would seem profitable to make the present opportunity the occasion for stating why this interest has come to exist.

Peripatus is a terrestrial invertebrate and has a body which is shortly vermiform, semicylindrical, flat on the ventral surface, and covered with a soft transversely-wrinkled skin. The body segments are few and not distinctly defined, and each gives rise to a pair of

feet or modified feet. The cephalic and mouth segments are united and continuous. There are two sub-retractile frontal tentacles or antennæ. The eyes, two in number, are simple and situate at the external base of the antennæ. The mouth is ventrally situated nearly circular, and surrounded by a thick lip—the short exsertile pharynx. It includes the two appendages of the first pair, the foot-jaws or maxillæ, each of which bears two hooks, one simple the other toothed. On each side of the mouth are the second pair of appendages; these are like the succeeding foot-like ones, but do not each terminate in claws but in a pore—the outlet of the channel leading from the slime glands. The feet proper are short, swollen, conoidal from within outwards, numbering from 33 to 14 according to the species. Towards the apex they are distinctly jointed, and on the under surface bear subcorneous foot-pads. At the extreme end, after being suddenly narrowed, two little hooks are borne. The anus is posterior, and the genital aperture just in front of it on the ventral surface.* Numerous microscopic pores or stigmata, from which tracheæ take their origin are scattered all over the surface of the body (Moseley). *Peripatus* is viviparous and, according to almost all authorities, bisexual. The males are usually the smaller, otherwise the sexes are outwardly similar. It may attain a length of $2\frac{1}{2}$ inch., but usually measures much less. It is nocturnal in its habits, and during the day remains secluded under stones or rotten logs. By alternate movement of its feet it progresses quickly over the ground. It is carnivorous, and when molested, or in the presence of its prey, rapidly ejects a thick very tenacious fluid from the appendages on either side of the mouth, and so often forms a complete network of slime. During growth it changes its skin entirely more than once, and reserve claws, especially in the case of the jaw-feet, can be observed within the ones actually in use. Nowhere, where it occurs in its natural haunts, is *Peripatus* common. At the Cape it is “remarkably local and not by any means easy to find.” Ernst, in the case of *P. Edwardsii*, failed at first after long and diligent search to meet with the animal anywhere. It is so also with the New Zealand species. However it may occasionally be met with plentifully in quite frequented places where least expected. Ernst procured numbers from a courtyard (*Nature*, 10th March, 1881, p. 447), and our species exists within the precincts of the Brisbane Hospital.

* Dr. E. Grube, “Voyage der Novara,” Zool. Theil. Bd. II., Anneliden, p. 4. Vienna, 1864-7.

The different species of *Peripatus* have a wide geographical range. (1) *Peripatus juliformis*, *Guild*, 1826, has been reported from St. Vincent and other West Indian islands ; (2) *P. Edwardsi*, *Blanch*, 1847 (*P. juliformis*, Andouin et M. Edw., 1833) from Venezuela and French Guiana ; (3) *Blainvillei*, *Blanchard*, 1847, from Chili, and from St. Thomas—*Baird* ; (4) *P. capensis*, *Grube*, 1864-7 (*P. brevis*, *Blainville* et *Gervais*) from Cape of Good Hope ; (5) *P. Leuckarti*, *Saenger*, 1869, from New Holland ; (6) *P. quitensis*, *Schmarda*, 1871, from Quito ; (7) *P. novæ-zealandiæ*, *Hutton*, 1876, from New Zealand ; (8) *P. torquatus*, *Kennel*, from Trinidad ; and (9) *P. Balfouri*, *Sedgwick*, 1885-6, from Cape of Good Hope.

Its chief interest resides in the fact that from its structure it must be regarded as a prototype and ancestor of one of the great sub-kingdoms of animals, viz., that one comprising the air-breathing and other Arthropods, and at the same time a connecting link between these and animals still lower in the scale than they. Its relations with other animals point to such diverse affinities that its position amongst invertebrates has been a matter of dispute.

The founder of the genus, the Rev. L. Guilding, in 1826 placed *Peripatus* in the sub-kingdom, which included the shell-bearing and naked molluscs ; *Gervais*, in 1837, pronounced it a myriapod. Other naturalists, including *Guatrefages*, *Blanchard* and *Milne-Edwards* decided that it was a member of the sub-kingdom *Vermes*—the worms, and *Ehlers*, *Schmarda*, *Claus*, *Grube*, *Haeckel* and numerous other naturalists placed it also in this sub-kingdom, but in a separate family—the *Onchophora*. *De Blainville* located the genus *Peripatus* as coming between the *Myriapoda* and the worms. Latterly, however, *Gervais*' opinion has been upheld, and it has been placed by *Moseley* and others amongst the jointed-limbed animals, the *Arthropoda*, in the air-breathing section of that sub-kingdom, it being now regarded as the sole representative of the *Protracheata* of *Gegenbaur* and of the *Peripatidea* of *Huxley*. Different affinities are suggested according as one or other systems composing its organization are passed under review. For instance, to mention the indications given by *Gegenbaur* in different parts of his *Grundriss der Vergleichenden Anatomie*. Its simple, unsegmented body resembles that of one of the *Annulata*. Its appendages, like lateral expansions of the body, present serial similarity, as do the parapodia of *Annelids*, and as also, to a certain extent, do those of *Myriapods*. In *Peripatus*, as *Gegenbaur* remarks, the appendages retain their lowest condition, and their resemblance

to the appendages of Tracheata is only owing to their being endowed with terminal segments—and even these joints are but little differentiated, the extreme claw-bearing portion alone having any large amount of independence. On the other hand, as pointed out by Moseley, the fact that the first pair of appendages are terminated by modified claws, cause these appendages to be regarded as foot-jaws, and Peripatus therefore as being related to the Arthropods. The slime-secreting glands which are connected with apertures at the tips of the second pair of appendages are comparable only with organs which exist in tracheates. The muscular system, owing to its being constituted of separate bundles and to its non-striated character, is that of a member of the Vermes. Again, the nervous system is quite that of an animal lower than the Arthropods. Two cerebral ganglia united above the œsophagus surround the mouth and give off two non-ganglionated nerve-cords, which pass almost to the extremity of the body, with only faint indications of commissures. In the circulation system we find the simplest conditions as compared with other tracheates, there is a “dorsal vessel” or heart as in insects, but it extends the whole length of the body as in Myrapods. The alimentary canal, too, is of simple form, as in Myriapods and in the larva of insects, and the peri-enteric space or cœlom is devoid of those dissepiments which exist in the Annulata in connection with the metamerism of their bodies. Again, the respiratory system, with its generally distributed tracheæ, which Moseley was the first to observe, points to Peripatus as being an immediate ancestor of the air-breathing Anthropods.

A review of the literature which might be grouped under the heading Peripatus would teach of what immense interest is this animal to students of biology. Savants, too, have combined their scientific acumen in elucidating the lessons to be taught by an examination of this animal. And this interest is further emphasised by the fact that the Government Grant Committee of the Royal Society granted, in 1883, £100 to enable Prof. Sedgwick to proceed to the Cape for the purpose of studying Peripatus, and the Lords of the Treasury moreover agreed, it is believed, that one whole volume of the memoirs relating to the scientific work of the Challenger Expedition should be devoted to Peripatus.

Its discovery then in Queensland—its rediscovery in Australia—is therefore a noteworthy event. Like our *Ceratodus* it was no doubt formerly—but in an earlier geological epoch than it—widely distributed. It is, however, an animal which might have

existed without having left in the rocks any sign of its occurrence—its nature is not such as to permit it to have become fossilised at the time when they were formed. It still, however, as has been pointed out, is to be found in certain spots on the earth's surface, widely separated, where it is to be met with under almost precisely similar conditions. In intermediate districts *Peripatus* may yet still exist, but probably in most of these it has died out. Prof. Moseley writes, "I am not without hope that its horny jaws may some day turn up in the fossil condition in strata older than the carboniferous, for of such age must *Peripatus* be if it be a representative of *Protracheata*."*

An Australia species of *Peripatus* was described by N. Sænger in 1869 under the name *Peripatus Leuckarti*, *sp. nov.*† This fact seems to have escaped the notice of compilers of the "Zoological Record," but Dr. Rud. Leuckart refers to it in the "Archiv für Naturgeschichte" for 1871, as has been pointed out to me by Mr. T. Whitelegge, of the Australian Museum. Several writers appear to have been familiar with the fact that Sænger published a minute anatomical investigation of two species of *Peripatus*, but his memoir being in Russian they do not seem to have derived the information, which it contains, of the "New Holland" habitat of one of the species dealt with. H. N. Moseley, however, knew that this was so, for he writes "he might have added Australia to the list of regions in which *Peripatus* occurs,"‡ commenting on an omission made in the "Observations on *Peripatus Novæzealandiæ*" of Capt. Hutton; and again he writes, "In the Australian and New Zealand species the number of feet seems fixed."§

The reported Australian habitat of *Peripatus*, however, was not confirmed until 1886, in which year the writer found two examples in a miscellaneous collection of invertebrates preserved in spirits, and forwarded from the Cardwell district by Mr. Kendal Broadbent, the collector of the Queensland Museum. Drawings of these immediately transmitted to Mr. Broadbent, whilst still in the Cardwell district, failed to recall to his memory the fact that he had actually found these two examples, much less the spot whence they came, and accordingly no more specimens were procured

* Ann. and Mag. of N.H., Vol. XIX., 1877.

† Verhändl der ersten russ Naturforscher versammlung zu Moskau, Abth. Zool. S, 1869, 237-262.

‡ Ann. and Mag. N.H. 4th Ser., Vol. XIX., p. 85, 1877.

§ *op. cit.* 5th Ser. Vol. III., p. 263, 1879.

from the district. These treasures were taken to Sydney in November, 1886, and were exhibited, as is well known, to all the leading zoologists there,* it being intended that they should ultimately be submitted to minute examination at the hands of Mr. W. H. Haswell, out of regard for his anatomical skill. As, however, they were lost or mislaid, somewhere in Sydney, this intention could not be carried out, although ultimately no doubt they may fall into the hands of a naturalist who will discover their interest, although not the locality whence they were procured, for this until the present occasion has not been made known. A single specimen of *Peripatus* was next met with by the writer under dead wood in a gully in Victoria Park, Brisbane, and again still more recently, whilst in company with Mr. F. A. A. Skuse—who was fortunate in having the habits and economy of this strange animal brought so prominently to his notice on the occasion of his first hearing of its name—several examples were procured under stones within a short distance of the General Hospital.

Concerning the Australian *Peripatus*, Leuckart, in giving some account of Sænger's paper, informs us that the new species, that which came from New Holland, is described therein as follows:—Fifteen pair of feet stumps, between the last pair of which the generative orifice is situated. On the under side of the feet are three elevations (*erhebungen*), of which one is long and arch-shaped, whilst the two others are short and straight. Length, 21 mm.; greatest breadth, 3.05 mm.†

Had evidence not been now forthcoming of the existence of an Australian species, and especially since so vague a definition of the habitat of *Peripatus* Leuckarti, as is conveyed by the term New Holland is given, it might have been concluded that Sænger had the New Zealand species in view, for his diagnosis mentions no character which is not found in *Peripatus* *Novæ-zealandiæ*. And the fact is, the Australian (or Queensland at least) and New Zealand species are strikingly similar, and the comparison then of examples from the two sources indicated will be thwart with much interest. The greater part of Sænger's definition, bearing in mind that the identity in the number of feet has been elsewhere pointed out by Prof. Moseley, is contained in the following statement made by the latter authority concerning *Peripatus* *Novæ-zealandiæ*,

* It is to this fact that Mr. Fletcher alludes when he mentions "its re-discovery in Queensland last year (1886)." *Ibid.* Proc. Lin. Soc., N. S. Wales, 2nd Ser. II., p. 450.

† *Archiv für Naturg.*, p. 406-7; Berlin, 1871.

and he might with equal truth have related it of the species before us:—"It has a distinctly prolonged but short conical tail with a knob-like enlargement at its extremity. . . . The anus being terminal the vulva is separated from it, and situate at a considerable interval further forward and between the last pair of members."*

Comparison between the two species cannot proceed further now, since access to specimens of *Peripatus Nova-zealandiæ* or one or other of the more elaborate memoirs on *Peripatus* is denied us. It may be of interest, however, to remark concerning our species, that it exhibits the same variation in colouring which occurs in the different species of the genus, and as is exemplified in *P. capensis*—as we learn from Grube's remarks—and in *P. Novæ-Zelandiæ*, as Professor Hutton records, and as is known from personal observation on the living New Zealand animal.

The Australian species is very dark blue, almost black, with a few rust-like specs here and there, and lighter coloured beneath; or dark fuscous, with a still darker line along the back. The papillæ which arise in a single linear series along the close-transverse wrinkles on both surfaces of the body and limbs, are small blunt cones, composed of little three or more carinated imbricate scales, and terminate in erect spines, those on the upper surfaces being much larger than beneath. These papillæ are contiguous one to the other. The antennæ are about thirty-ringed, their basal halves are swollen and then suddenly contract to the distal halves, which are of equal breadth, with short obtuse points. The rings of the narrow portion of the antennæ are relatively longer than are those of the broad basal half. Around each ring there is a single line of short setæ. The mouth is surrounded by a broad white lip, having thirteen strong folds. The horny claws terminating the foot-jaws contain two reserve claws, one within the other—as in the New Zealand *Peripatus*. The first jaw-claw is six-toothed, having one large tooth in front and five smaller ones behind. These latter—all of the same shape—are acute like the large tooth and, although the one immediately adjacent to it is about equal in size to the third tooth, the five form a series, the members of which otherwise, regularly diminish in size, and in this respect and in their uniformity differ from what occurs in the New Zealand species.†

* Moseley, Ann. and Mag., of N.H., Vol. XIX., p. 90, 1877.

† Hutton. Ann. and Mag. of N. H., 4th Ser., Vol. XVIII. Pl. It is interesting to observe that what is given as a character of the genus by Guilding (Zool. Journ., 1826, II., p. 444), viz.: the "ungues multifidi" exists, in this and other species, only in one of the claws of the foot-jaws.

The external jaw-claw is simple, with a slight elevation at the base of the claw proper, between it and the plain bordered portion. The pits on the foot-pads (*acrei* of Grube) are circular. Of these pads, the first three cover the three joints which form the tip of the conical leg, and of them the proximal is very much shorter than either the second or third. The terminal pads are each longer than broad, and the fifth, which forms the enlarged claw-bearing extremity of the legs, partly embraces the ovate fourth joint.

ANNUAL MEETING, 8TH JULY, 1887.

THE PRESIDENT A. NORTON, M.L.A., IN THE CHAIR.

THE Fourth Annual Meeting of the Society was held in the library of the Queensland Museum, on Friday, 8th July. The President, A. Norton, M.L.A., in the chair. The following report of the Council, including the Report of the Field Naturalists' Section, and Balance-sheet were read by the Hon. Secretary, and afterwards on the motion of L. A. Bernays, F.L.S., seconded by Dr. Bancroft, were adopted.

TO THE MEMBERS OF THE ROYAL SOCIETY OF QUEENSLAND.

GENTLEMEN,—Your Council beg to report to you on the progress of the Society since the date of the Annual Meeting, as follows :—

On the books of the Society there are now 166 members, inclusive of 46 whose subscriptions for 1886 are still in arrear, and exclusive of four who have retired, and 2 who are deceased.

A census of the Society gives the following results :—

Corresponding Members	1
Life Members (of late Queensland Philosophical Society)	13
Life Members (compounded)	10
Ordinary Members	142
Total	166

The number of new members elected during the past year amounts to 26.